

## **Multi-scale temporal and spatial variability of the solar energy resource at Reunion Island (21° South, 55° East): regimes and meteorological patterns**

J. Badosa (1,2) and M. Haeffelin (1)

(1) Institut Pierre Simon Laplace, Ecole Polytechnique, France (jordi.badosa@lmd.polytechnique.fr), (2) Ecole Nationale de Ponts et Chaussées, France

To increase the penetration of electricity production from large photovoltaic farms in the distribution network, stability and prediction of this production must be improved. Photovoltaic energy production depends primarily on the characteristics of the solar energy resource reaching the ground. This solar irradiance can be highly variable at temporal and spatial scales depending on the cloud characteristics and on the considered region. The characterization of these variabilities and the understanding of their meteorological causes are essential steps to improve solar irradiation forecast.

In this work we investigate the characteristics of the solar resource over the Reunion Island (21°S, 55.5°E), in the South-Western Indian Ocean. Being in the Tropics, Reunion Island has high solar resource, however the photovoltaic production is highly variable on short temporal and spatial scales. The island is characterized by very strong orography with a radius of about 30km and mountaintops near 3 km altitude. Weather forecasts are challenged by complex terrain and small scales effects not accounted for in NWP models.

We will present the temporal and spatial variability of the solar resource. We will show links between solar radiation regimes and associated meteorological conditions at different temporal and spatial scales. In particular, dynamical patterns (trade winds, breezes, stability), cloud cover patterns (shallow convection, cirrus clouds) and resulting solar radiation patterns will be presented. Our analyses are based on ground and satellite measurements as well as reanalysis data.

We will conclude on the feasibility of improving short-term forecasts.